WHAT IS CLAIMED IS:

1. A mathematical model, the model being comprised of basis objects, each basis object being defined by a mathematical function, each basis object having a spatial relationship to all of the other basis objects, the basis objects and the spatial relationships between the basis objects defining a three-dimensional (3-D) geometry of the model, the model being stored on a computer-readable medium, wherein the model is capable of being transformed by one or more transformation operators, each transformation operator being associated with a predetermined transformation operation, wherein when one of the transformation operators operates on one of the basis objects, the spatial relationship between the basis object that is operated on and at least one other basis object is varied, thereby causing the geometry of the model to be varied.

2. The model of claim 1, wherein the basis objects are analytical basis objects, and wherein the mathematical function defining each basis object is a quadratic equation.

3. The model of claim 1, wherein the basis objects are polygonal basis objects, each polygonal basis object corresponding to at least one polygon, each polygon having at least three vertices, the mathematical function defining each polygonal basis object describing a plane that is defined by line segments that connect the vertices of each polygon comprising the polygonal basis function.

4. The model of claim 1, wherein at least one of the basis objects is an analytical basis object and wherein at least one of the basis objects is a polygonal basis object, the mathematical function defining each analytical basis object being a quadratic equation, and wherein each polygonal basis object is comprised of at least one polygon, each polygon having at least three vertices, the mathematical function defining each polygonal basis object describing a plane that is defined by line segments that connect vertices of each polygon comprising the polygonal basis object.

5. The model of claim 1, wherein the transformation operations include scaling, translation, rotation and torsion, and wherein one or more of the transformation operations can be performed on the basis objects as a function of time to thereby cause the geometry of the model to be varied as a function of time.

6. The model of claim 4, wherein the transformation operations include scaling, translation, rotation and torsion, and wherein one or more of the transformation operations can be performed on the basis objects as a function of time to thereby cause the geometry of the model to be varied as a function of time, and wherein the model includes information that describes the transformation operations that are to be performed on particular basis objects at particular instants in time, the transformation operations to be performed on particular basis objects occurring at particular instants in time such that the 3-D geometry of the model varies as a function of the time.

7. The model of claim 4, wherein the model is a model of the human heart and thorax, and wherein the transformation operations include scaling, translation, rotation and torsion, and wherein one or more of the transformation operations can be performed on the basis objects as a function of time to thereby cause the geometry of the model to be varied as a function of time, and wherein the model includes information that describes the transformation operations that are to be performed on particular basis objects at particular instants in time in the cardiac cycle, the transformation operations to be performed on particular basis objects occurring at particular instants in time in the cardiac cycle such that the 3-D geometry of the model varies as a function of the timing of the cardiac cycle.

8. The model of claim 1, wherein the transformation operations include scaling, translation, rotation, and torsion, and wherein one or more of the transformation operations can be performed on the basis objects as a function of time to thereby cause the geometry of the model to be varied as a function of time, and wherein the model includes information that describes the transformation operations that are to be performed on particular basis objects at particular instants in time, the

transformation operations to be performed on particular basis objects occurring at particular instants in time such that the 3-D geometry of the model varies as a function of time, each basis object having a priority value associated therewith, each basis object having a linear attenuation coefficient associated therewith, the model including information identifying the priority value and the linear attenuation coefficient associated with each basis object.

9. The model of claim 1, wherein the model is a model of the human heart and thorax, wherein the transformation operations include scaling, translation, rotation, and torsion, and wherein one or more of the transformation operations can be performed on the basis objects as a function of time to thereby cause the geometry of the model to be varied as a function of time, and wherein the model includes information that describes the transformation operations that are to be performed on particular basis objects at particular instants in time in the cardiac cycle, the transformation operations to be performed on particular basis objects occurring at particular instants in time in the cardiac cycle such that the 3-D geometry of the model varies as a function of the timing of the cardiac cycle, each basis object having a priority value associated therewith, each basis object having a linear attenuation coefficient associated therewith, the model including information identifying the priority value and the linear attenuation coefficient associated with each basis object.

10. A mathematical model of the human heart and thorax, the model being comprised of basis objects, each basis object being defined by a mathematical function, each basis object having a spatial relationship to all of the other basis objects, the basis objects and the spatial relationships between the basis objects defining a three-dimensional (3-D) geometry of the model, the model being stored on a computer-readable medium, wherein the model is capable of being transformed by one or more transformation operators, each transformation operator being associated with a predetermined transformation operation, wherein when one of the transformation operators operates on one of the basis objects, the spatial relationship between the basis object that is operated on and at least one other basis object is varied, thereby causing the geometry of the model to be varied.

11. The model of claim 10, wherein the basis objects are analytical basis objects, and wherein the mathematical function defining each basis object is a quadratic equation.

12. The model of claim 10, wherein the basis objects are polygonal basis objects, each polygonal basis object corresponding to at least one polygon, each polygon having at least three vertices, the mathematical function defining each polygonal basis object describing a plane that is defined by line segments that connect the vertices of each polygon comprising the polygonal basis function.

13. The model of claim 10, wherein at least one of the basis objects is an analytical basis object and wherein at least one of the basis objects is a polygonal basis object, the mathematical function defining each analytical basis object being a quadratic equation, and wherein each polygonal basis object is comprised of at least one polygon, each polygon having at least three vertices, the mathematical function defining each polygonal basis object describing a plane that is defined by line segments that connect vertices of each polygon comprising the polygonal basis object.

14. The model of claim 10, wherein the transformation operations include scaling, translation, rotation and torsion, and wherein one or more of the transformation operations can be performed on the basis objects as a function of time to thereby cause the geometry of the model to be varied as a function of time.

15. The model of claim 13, wherein the transformation operations include scaling, translation, rotation and torsion, and wherein one or more of the transformation operations can be performed on the basis objects as a function of time to thereby cause the geometry of the model to be varied as a function of time, and wherein the model includes information that describes the transformation operations that are to be performed on particular basis objects at particular instants in time, the transformation operations to be performed on particular basis objects occurring at particular instants in time such that the 3-D geometry of the model varies as a function of the time.

16. The model of claim 13, wherein the transformation operations include scaling, translation, rotation and torsion, and wherein one or more of the transformation operations can be performed on the basis objects as a function of time to thereby cause the geometry of the model to be varied as a function of time, and wherein the model includes information that describes the transformation operations that are to be performed on particular basis objects at particular instants in time in the cardiac cycle, the transformation operations to be performed on particular basis objects occurring at particular instants in time in the cardiac cycle such that the 3-D geometry of the model varies as a function of the timing of the cardiac cycle.

17. The model of claim 10, wherein the transformation operations include scaling, translation, rotation, and torsion, and wherein one or more of the transformation operations can be performed on the basis objects as a function of time to thereby cause the geometry of the model to be varied as a function of time, and wherein the model includes information that describes the transformation operations that are to be performed on particular basis objects at particular instants in time in the cardiac cycle, the transformation operations to be performed on particular basis objects occurring at particular instants in time in the cardiac cycle such that the 3-D geometry of the model varies as a function of the timing of the cardiac cycle, each basis object having a priority value associated therewith, each basis object having a linear attenuation coefficient associated therewith, the model including information identifying the priority value and the linear attenuation coefficient associated with each basis object.

18. A method for simulating an imaging system, the method comprising the steps of:

simulating a projection of rays from a source through a mathematical model, the model being comprised of basis objects, each basis object being defined by a mathematical function, each basis object having a spatial relationship to all of the other basis objects, the basis objects and the spatial relationships between the basis

objects defining a three-dimensional (3-D) geometry of the model, each basis object having a linear attenuation coefficient associated therewith;

simulating a collection of the simulated projected rays by a detector;

calculating rays sums by integrating the linear attenuation coefficients associated with basis objects of the model that are intersected by the simulated projected rays, the linear attenuation coefficients being integrated only along portions of the simulated projected rays that pass through the model; and

utilizing the calculated ray sums to reconstruct an image of the model.

19. The method of claim 18, wherein each basis object has a priority value associated therewith, and wherein the step of calculating the ray sums further comprises the step of:

for each ray that intersects an overlapping region of at least two basis objects, comparing the priority values of said at least two basis objects; and

if a determination is made that the priority values of said at least two basis objects are not equal, utilizing the linear attenuation coefficient of the basis object associated with the higher priority value for both of said at least two basis objects in calculating the ray sums.

20. The method of claim 19, further comprising the step of:

performing one or more transformation operations on one or more basis objects of the model, said one or more transformation operations including scaling, translation, rotation and torsion, and wherein said one or more transformation operations are performed as a function of time to thereby cause the geometry of the model to be varied as a function of time.

21. The method of claim 20, wherein the model is a model of the human heart and thorax, and wherein the transformation operations occur at particular

instants in time in the cardiac cycle such that the 3-D geometry of the model varies as a function of the timing of the cardiac cycle.

22. An apparatus for simulating an imaging system, the apparatus comprising:

first logic, the first logic configured to simulate a projection of rays from a source through an anatomical model, the model being comprised of basis objects, each basis object being defined by a mathematical function, each basis object having a spatial relationship to all of the other basis objects, the basis objects and the spatial relationships between the basis objects defining a three-dimensional (3-D) geometry of the model, each basis object having a linear attenuation coefficient associated therewith;

second logic, the second logic configured to simulate a collection of the simulated projected rays by a detector;

third logic, the third logic configured to calculate rays sums by integrating the linear attenuation coefficients associated with basis objects of the model that are intersected by the simulated projected rays, the linear attenuation coefficients being integrated only along portions of the simulated projected rays that pass through the model; and

fourth logic, the fourth logic configured to utilize the calculated ray sums to reconstruct an image of the model.

23. The apparatus of claim 22, wherein the first, second, third and fourth logic are comprised by a computer, the first, second and third logic corresponding to a forward projection routine being executed by the computer.

24. The apparatus of claim 23, wherein the imaging system being simulated is an x-ray computed tomography system.

25. The apparatus of claim 23, wherein the imaging system being simulated is a positron emission computed tomography system.

26. The apparatus of claim 23, wherein each basis object has a priority value associated therewith, and wherein the third logic calculates the ray sums by identifying each ray that intersects overlapping regions of at least two basis objects, by comparing the priority values of said at least two basis objects, and by utilizing the linear attenuation coefficient of the basis object associated with the higher priority value for both of said at least two basis objects in calculating the ray sums.

27. The apparatus of claim 23, wherein the model is capable of being transformed by one or more transformation operators, each transformation operator being associated with a predetermined transformation operation, wherein when one of the transformation operators operates on one of the basis objects, the spatial relationship between the basis object that is operated on and at least one other basis object is varied, thereby causing the geometry of the model to be varied, and wherein the model includes information that describes the transformation operations that are to be performed on particular basis objects at particular instants in time, the transformation operations to be performed on particular basis objects said one or more transformation operations being performed by the first logic at particular instants in time such that the 3-D geometry of the model varies as a function of the time, each basis object having a priority value associated therewith, each basis object having a linear attenuation coefficient associated therewith, the model including information identifying the priority value and the linear attenuation coefficient associated with each basis object.

28. The apparatus of claim 23, wherein the model is a model of the human heart and thorax, and wherein the model is capable of being transformed by one or more transformation operators, each transformation operator being associated with a predetermined transformation operation, wherein when one of the transformation operators operates on one of the basis objects, the spatial relationship between the basis object that is operated on and at least one other basis object is

varied, thereby causing the geometry of the model to be varied, and wherein the model includes information that describes the transformation operations that are to be performed on particular basis objects at particular instants in time in the cardiac cycle, the transformation operations to be performed on particular basis objects said one or more transformation operations being performed by the first logic at particular instants in time in the cardiac cycle such that the 3-D geometry of the model varies as a function of the timing of the cardiac cycle, each basis object having a priority value associated therewith, each basis object having a linear attenuation coefficient associated therewith, the model including information identifying the priority value and the linear attenuation coefficient associated with each basis object.